Computer Science for Muncie (and Surrounding) Schools (CS4MS+)

CS4MS+

Partnering with local schools, the **Computer Science for Muncie (and Surrounding) Schools (CS4MS+)** project team researched, developed, curated, and delivered instructional resources which incorporate Computer Science (CS) into educational offerings, with a focus on the Indiana CS academic standards, and worked to advance teachers' understanding of CS and/or interacted with their students as a teaching assistant. Although CS student focused, an interdisciplinary project team was sought, with another project focus being to expose underrepresented minorities and females to CS. When Indiana introduced CS into their academic standatrds, CS4MS+ was created to support local teachers in this endeavor. **To learn more, please click on the "Computer Science for Muncie (and Surrounding) Schools (CS4MS+)" title above,** then use the links provided to the right when the new page appears.

Students:

Please review the participant page for a list of all BSU students involved with this project over the semesters.

Community Partners:

- Northside Middle School, Muncie, Delaware County, IN.
- Muncie Central High School, Muncie, Delaware County, IN.
- Burris Laboratory School, Muncie, Delaware County, IN.
- Daleville Jr./Sr. High School, Daleville, Delaware County, IN.

College:

Sciences and Humanities

Contact:

cs4ms@bsu.edu

"*The CS4MS+ project was a great and unique experience for me. I always had a passion to teach others about Computer Science and this was a fun opportunity to do so. It left me feeling that I had actually impacted the future of the students and teachers that we interacted with.*" ~Participating student

Credits

Faculty mentor: David L. Largent, Department of Computer Science

Overview · Computer Science for Muncie (and Surrounding) Schools (CS4MS+) · Immersive Learning Showcase 2021

Overview

Overview

In search of an answer to our project essential question, ***"How can we increase exposure and access to computer science for ALL kindergarten through high school students?"***, the Computer Science for Muncie Schools (or CS4MS+) project is made up of a team of immersive learning students who have connections to or are interested in computer science or computer technology.

Our mission in CS4MS+ is to educate and encourage ***all*** *K-12 students in the exploration of computer science and computational thinking by interacting with students, their educators, and the community.*

We will accomplish this goal by providing resources, personal insights, and activities that will engage younger generations and help reinforce these concepts.

Furthermore, we will increase community involvement and awareness of the resources provided by CS4MS+ to allow our efforts to continue beyond this semester.

Research suggests that social and cultural factors may be behind the under-representation of many demographics in STEM fields, and in particular Computer Science (CS). As a result, students have little idea what it means to be a computer scientist and lose the opportunity to become one.

To facilitate this project, we partnered with a variety of local schools. They serve students from diverse backgrounds who frequently do not have the resources available to participate in CS and Computational Thinking (CT) activities.

The focus of this immersive learning course is to expose our partners' students, particularly underrepresented minorities and females, to CS and CT. This project aims to assist the teachers by curating, developing, and documenting lessons and activities that incorporate CS and CT experiences for their students, which can ultimately lead to future STEM opportunities and careers for these students.

We encourage you to explore the various pages (see buttons to the right) to learn more about our efforts, and why we were selected as one of the recipients of the 2020 Immersive Learning Faculty Awards. The purpose of these awards is to recognize faculty for demonstrating excellence in the creation, mentoring, and execution of immersive learning projects. Our mentor, Dave Largent, fully acknowledges that he could not have accomplished any of this with out the interest and support of our BSU participants, our community partners, and the support of many levels of administrators at Ball State University. **We also are very grateful for the generous funding provided to us through the Provost Immersive Learning Grant program.**

Watch this brief video to directly hear from some of our BSU participants about how they were impacted by this project.

Watch Video At: https://youtu.be/_SfQuN5uNCM

Contact:

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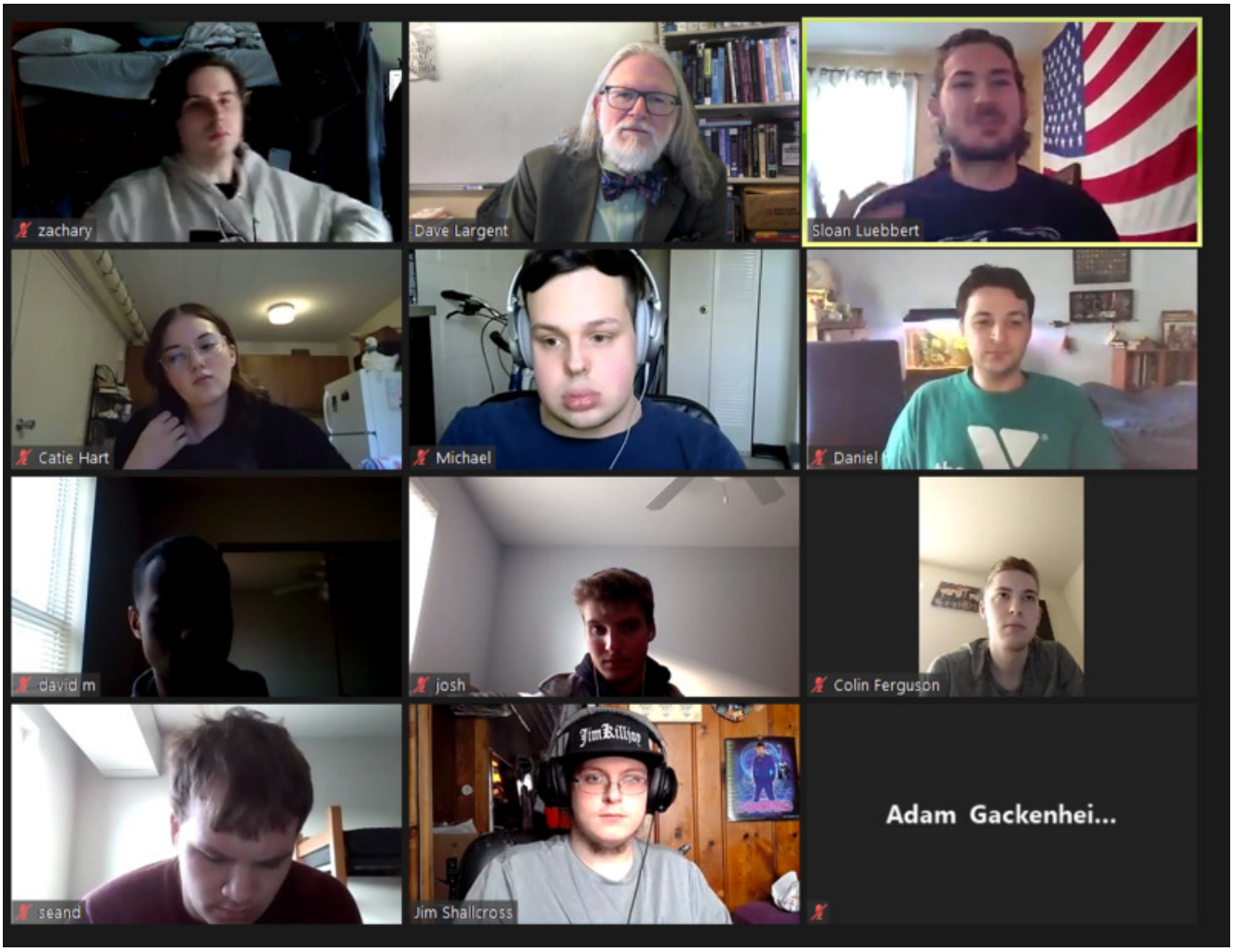
Participants →
Overview

Participants · Computer Science for Muncie (and Surrounding) Schools (CS4MS+) · Immersive Learning Showcase 2021

Participants

Participants

This being a multi-year immersive learning project, multiple groups of BSU learners have participated in this project. They are listed here, along with a group photo for each semester. Until the 2020-2021 academic year, the project only ran during the fall semester.



Spring 2021

- Josh Birnbaum
- Zachary Criswell
- Colin Ferguson
- Adam Gackenheimer
- Daniel Isenberg
- Michael Keen
- Sloan Luebbert
- David Mitchell
- Jim Shallcross

Fall 2020

- Ben Eger
- Beth Eyrick
- Josh Johannsen
- Lloyd Rowe
- Abdrew Stafford
- Drew Thomas
- Brian Walker
- Hunter Wallace
- Sean Wolfe
- Kiri Woodruff

Fall 2019

- Sara Bailey
- Luke Betts
- Ben Bishop
- Chris Bucker
- Corbin Creedon
- Gwyn Hultquist
- Dakota Savage
- Joe Schmidt
- Madison Turley
- Brian Walker
- Sean Wolfe

Fall 2018

- Ryan Ahler
- Luke Betts
- Austin Bolles
- Michael Bratton
- Will English
- Josh Passey
- Alexander Perry
- Sarah Phipps
- Adam Wessel
- Morgan Williams

Fall 2017

- Monica Appel
- Meghan Duffy
- Rachel Harvey
- Anna Hawkins
- Ben Lawson
- Ryan Magley
- JR Pegg
- Ian Pemberton
- Jordan Reidy
- Timothy Skinner
- Cody York

"*I had a wonderful experience in teaching others about the basics in programming, while also building my confidence in public speaking*." ~Participating student

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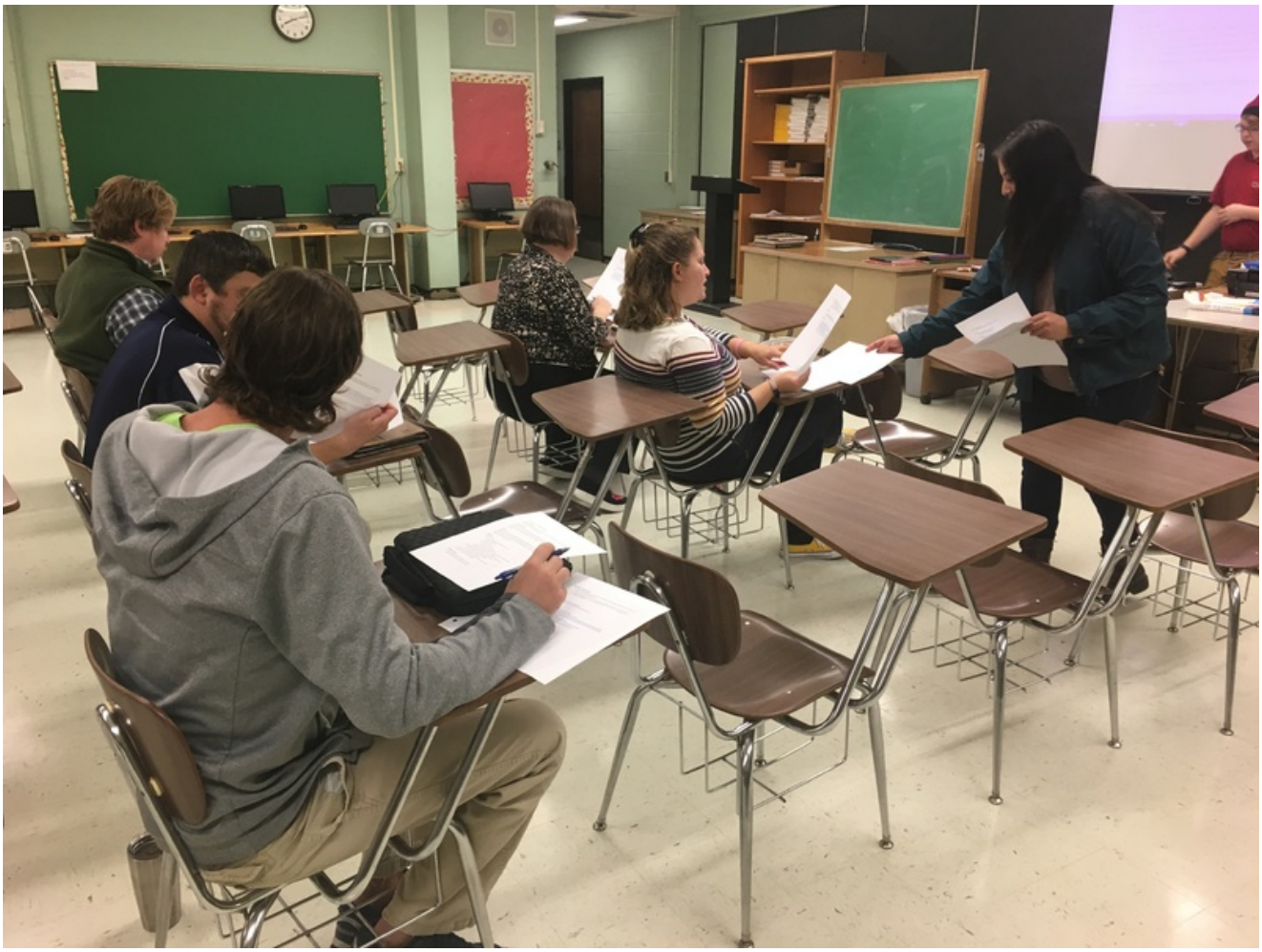
Background and history

Background: Why are we doing this?

Diversity is essential for the future success of CS. Further, there is simply a lack of student exposure to CS in elementary and secondary schools. Students are exposed to the physical sciences and mathematics, but seldom CS. Thus, students likely have little idea what it means to be a computer scientist, or if they have an interest in being one. With the recent adoption of CS K-12 academic standards in Indiana this is changing, but most local teachers have little, or no experience teaching CS topics. By providing needed resources, CS4MS+ is enabling local teachers to give underrepresented minorities and females access to high-paying jobs through exposure to CS education.

Becoming more robust each year, CS4MS+ built on the successes of prior years. The impact has expanded to more schools and age groups, thus serving an ever-increasing number of Muncie community and surrounding school students. The CS department has established a new course to facilitate school and community outreach, which will be taught for the first time during the fall 2021 semester.

CS4MS+ hosts a teacher workshop



History

During the fall semesters of 2017-2020 and spring 2021, the CS4MS+ teams, consisting of 51 BSU students (11, 10, 11, 10, 9) and a faculty mentor, researched, developed, and curated instructional resources that incorporate CS experiences, with a focus on supporting the new Indiana CS academic standards. CS4MS+ teams developed a teaching resource website to make the curated resources more widely available.

Our community partners, Northside Middle School (NMS), Muncie Central High School (MCHS), Daleville Jr/Sr. High School (Daleville), and Burris Laboratory School (Burris) have utilized our curated resources and implemented them based on their needs. CS4MS+ teams also spent time in our partners' classrooms, delivering content to the students and assisting the teachers by answering students' questions.

"*Watching students respond with genuine interest and excitement to something I helped set up and create was an extremely gratifying experience that left me wanting more. The 'ah-ha' moment was awesome. One second they were all following what we were teaching (binary numbers/converting to/from decimal), and maybe even reasonably interested, but*

then we showed them how you could “send” a “picture” to someone by simply giving them a handful of numbers and the reactions went from “ok, I follow, but where is this going?” to “whoa, that’s cool!" ~Participating student

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Student impact · Computer Science for Muncie (and Surrounding) Schools (CS4MS+) · Immersive Learning Showcase 2021

Student impact

Student impact

CS4MS+ has a positive effect on BSU students. It offers an experience unlike any other CS course. Some participants expressed interest in teaching CS in elementary or secondary schools as a result of their experiences in CS4MS+. Being student-led, participants' NACE workforce competencies are drastically improved by the end of their participation.

Student control

With the exception of the first month each semester, the students were largely in control of their destiny, activities, and learning. During the first month, the faculty mentor provided a series of guided discussions and other opportunities to become immersed in the foundational knowledge and experiences that would allow them to move forward on their own to determine the specific direction of CS4MS+. The students engaged in inclusive and culturally responsive pedagogy training, team building exercises, created and worked in teams to evaluate our partners' needs, compiled and analyzed the results, investigated, developed, modified, and validated modules, and delivered the validated resources to our partner for implementation.

Even though the faculty mentor met with the school administration prior to each semester, the students had control over their learning experiences. The mentor worked to establish a solid foundation with the partners, which allowed the students to be more effective throughout the immersive learning experience. The students determined what the CS4MS+ deliverables were going to be, and how and on what schedule they were going to be produced and delivered. After the first month, the faculty mentor served largely as a resource, rather than a leader or guide.

Student collaboration

Initially, the students worked as a large group each semester, but they soon recognized the need for smaller working groups to develop our deliverables in parallel. Once they formed these smaller groups, they became much more productive and cohesive as a group. Productivity increased dramatically at that point, as they better understood how to work as a team and communicate between the smaller working groups.

Collaboration with the community partners included data-gathering, validation, and status report meetings throughout the semester. A few weeks into most semesters, the students were able to observe classes to gain an understanding of what was being provided, and the environment in which they were working. The 2017 project team developed and delivered a workshop for the computer teachers. They also developed and presented an Hour of Code activity to all seven computer classes the last week of the semester, directly interacting with the NMS students. During 2019 and 2021, CS4MS+ teams developed and presented a variety of CS topics directly to the partners' students.

Student learning outcomes

- Students experienced and participated in the following activities and experiences during each semester:Create a constructive collaborative climate.
- Apply previous knowledge or skills to demonstrate comprehension and performance in novel situations.
- Create, document, and curate problem- and inquiry-based learning resources which are user-tested and accessible to all.
- Plan, manage, present, and evaluate a multi-week project developed by small teams using an incremental and iterative approach.
- Demonstrate reflective practice for professional improvement.
- Demonstrate strengthened workforce competencies, as defined by NACE. These competencies are:
    - Critical Thinking/Problem Solving
    - Oral/Written Communications
    - Teamwork/Collaboration
    - Digital Technology
    - Leadership
    - Professionalism/Work Ethic
    - Career Management
    - Global/Intercultural Fluency

"*Participating in this course allowed me to build on many skills that will be useful in future careers. In particular, this course has improved my communication and collaboration skills.*" ~Participating student

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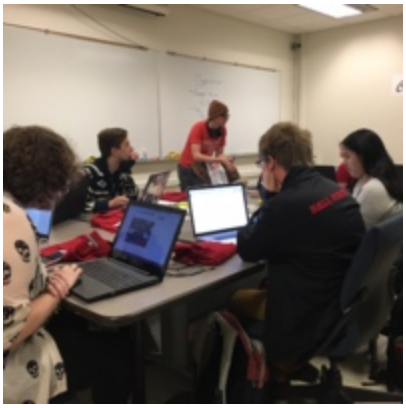

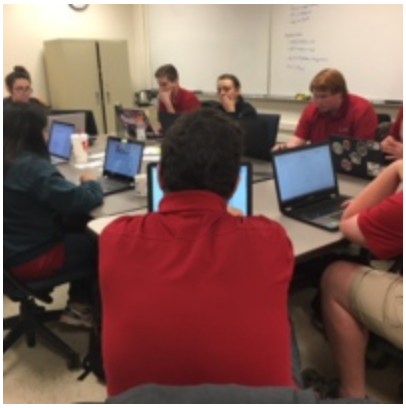

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Partner and community impact

Partner involvement

The school (assistant) principals met with CS4MS+ teams to establish each school's needs, and then to receive our report of what we accomplished. Additionally, they facilitated our ability to conduct classroom observations, meet with teachers, and to implement classroom activities. They were very accommodating and excited to continue our partnerships the next fall. The teachers were very welcoming, in varying degrees, as well. In most instances, the teachers were very receptive to the help we were offering. The principals and teachers provided validation of our progress.

CS4MS+ team at Burris Laboratory School

Partner benefits

By providing a well-developed CS resource to our partners, they are better prepared to provide CS learning opportunities to the youth of our community. In particular, we hope that underrepresented minorities and females will participate in the implemented modules to

promote their involvement in CS throughout their life, thus increasing the diversity within the CS field. Further, many middle schools have only recently started exploring how they can meet the new Indiana academic standards for CS. The resources curated by CS4MS+ teams, and the partner interactions with them will assist in this process.

In particular, CS4MS+ curated and provided our partners a document designed to explain the Indiana academic standards for CS in plain English, and which provides many alternative activities which can be utilized to teach each standard. The principals reported the resources were very useful, especially to new teachers. This has allowed our partner schools to implement more CS activities into their curriculum, and hopefully, to perform better on standardized testing.

CS4MS+ teams have spent many hours in the classroom over the project life. This has included preparing lessons and presenting them to the students, as well as simply being present to help the teacher answer questions. Many of the teachers report they continue to use activities CS4MS+ teams presented.

Community Impact

Through the products and activities of CS4MS+, many hundreds (perhaps even thousands) of Muncie and surrounding area students have been exposed to more CS concepts and activities than before our participation. Short term, it should improve the students' performance on CS-related standardized testing questions. Long term, this potentially broadens the students' view of future professions, perhaps opening more doors for underrepresented minorities and females, and helping all students to see CS as a possible area of interest, which can lead to well-paying jobs.

"Our teacher who participated in this program grew from the expertise of those who worked with her and felt much more comfortable and capable to deliver instruction on middle school computer science topics." ~Participating administrator

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What we've done · Computer Science for Muncie (and Surrounding) Schools (CS4MS+) · Immersive Learning Showcase 2021

What we've done

Project outcomes and products

The major activities and products of CS4MS+ include the following:

CS4MS+ demonstrates a computer science concept

- Multiple meetings with principals and teachers to discuss and validate curated educational resources
- Developed and presented a CS workshop for teachers

- Developed and curated CS lessons that can be incorporated into the teachers' (sometimes non-CS) curriculum
- Developed three major documents (explanations of the Indiana state academic standards for grades 6-8, other activities, and worksheets and other supporting resources) and many other supporting documents to assist teachers to successfully implement CS standards
- Developed a website to make the curated resources widely available
- Attended "Flipping the Switch: Integrating Computer Science Across the Indiana Curriculum Summit", and staffed the educational "toys" area (2 years)
- Developed and delivered many CS activities at our partner schools
- Assisted teachers by being present to answer questions
- Established a BSU student organization to informally continue some project efforts
- Participated in BSU Immersive Learning Showcases
- Channel 6 (RTV6) aired a short video filmed at Northside Middle School
- Multiple published accounts of CS4MS+'s efforts and impact

"*This class is an important one in my mind, one that allows for an experience unlike any other at Ball State and one that has an impact on the greater community and the lives of others.*" ~Participating student

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Looking ahead · Computer Science for Muncie (and Surrounding) Schools (CS4MS+) · Immersive Learning Showcase 2021

Looking ahead

Looking Ahead

CS4MS+ seeks to create a larger impact as it grows. Local schools are beginning to implement computer science clubs into their extracurricular repertoire, and the CS4MS+ team is excited to supplement them while they develop. This project views computer science education not only as a beneficial learning experience for students but also an opportunity for community engagement.

Community activities

CS4MS+ plans to develop and host events that community members can take part in, such as a coding summer camp. Students from local schools could join this interactive activity while taking the next step in furthering their computer science knowledge. This boot camp/workshop is in a similar vein to a hackathon but geared more towards curating skills in young students in a fun learning environment.

The first step towards creating such an event is hosting the first-ever CS4MS+ field trip on campus in the fall of 2021. The plan for the field trip is to offer a variety of activities modeled after resources provided by CS-Unplugged. CS-Unplugged compiles fun activities that young students can work together to perform in order to understand computer science concepts without the use of computers. Groups of students will circulate through stations led by CS4MS+ team members. To close, the students will gather to listen to an interactive presentation about the benefits of computer science knowledge.

Community partners

The CS4MS+ project started by working with local schools. While we plan to continue those relationships, we are also interested in partnering with other community organizations and non-profits. If you are part of such a group and want to include computer science and proplem solving activities in your programming, please contact us. We will be glad to explore the possibility with you.

The future of the CS4MS+ team

While the project has mostly consisted of students within the computer science major or minor, CS4MS+ hopes to expand its team's skillset in the future. The project is open to all majors, and would gladly accept education majors as part of the team! Students with minimal or no programming knowledge would be surprised to know how much they can contribute and learn.

CS 341: Computer Science Community & School Outreach

Starting in with the fall 2021 semester, the CS4MS+ project has an official course number in the CS curriculum, rather than using the CS 499: Independent Study course as it has previously. This will allow learners to see it listed in the course catelog and drectly sign up for the course, rather than needing to seek permission.

"*I enjoyed being able to assist in helping students find their passion in computer science, being able to teach students computer science concepts in a fun way was very enjoyable to me.*" ~Participating student

Contact:

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Contact us

Contact us!

If you found any of what you saw here interesting, we'd love to hear from you. Please contact us via email at **cs4ms@bsu.edu**. We look forward to hearing from you.

And if you're simply looking for our website, you'll find it here: **www.cs.bsu.edu/cs4ms/**

← Looking ahead
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Dublin Core

Title

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